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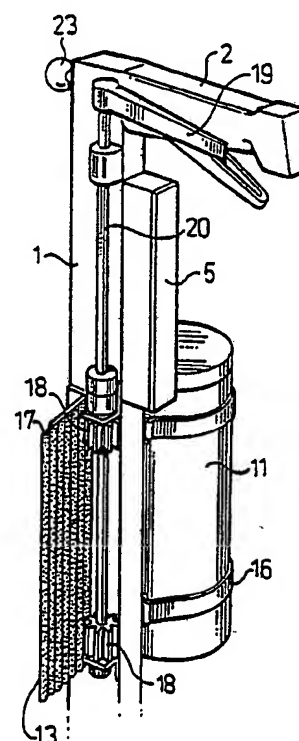
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(54) Title: A METHOD AND ARRANGEMENT FOR FEEDING STRAIGHT WIRE-SECTIONS TO A GIVEN POSITION

(57) Abstract

An arrangement for advancing straight wire-sections to a given position and for delivering the wire-sections at this position, for example in a feed tube provided in a machine (1) which is intended to bend the wire-sections into stirrup shapes in conjunction with joining together rods or the like. The arrangement includes means (18) for advancing a carrier strip (13), containing separate channels (17) for the wire-sections beyond this given position, the strip (13) being appropriately bendable along lines which extend parallel with the channels (17). The strip is advanced with the channels positioned generally in a vertical plane. The arrangement also includes means for exposing the bottom openings of the channels (17) upon passage of the given position, such as to enable the wire-sections disposed in respective channels (17) to slide from the channels axially under the influence of gravity, possibly assisted by other forces. The invention also relates to a method of advancing such wire-sections and to strip material for use when carrying out the method.



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A METHOD AND ARRANGEMENT FOR FEEDING STRAIGHT WIRE-
SECTIONS TO A GIVEN POSITION

5 The present invention relates to a method for feeding
straight wire-sections to and delivering said wire-sections at a given position, for example in a feed tube forming part of a machine which is constructed to bend the wire-sections into wire stirrups in conjunction with tying together rods or like objects. The invention also relates to an arrangement by means of which the wire-sections can be fed to said position, and also to strip material suitable therefor.

10 Described in my PCT-application No. PCT/SE91/00571 is a machine by means of which mutually intersecting rods can be joined together with the aid of wires, particularly for lashing or tying together reinforcement rods. The arrangement includes a feed tube to which straight wire-sections are fed, these wire-sections falling down through the feed tube and being pressed around a curved guide surface by a plunger so as to shape the wire-sections into a wire stirrup which embraces three sides of the rod intersection point concerned, whereafter the legs of the stirrup are twisted around one another on the fourth side of said intersection point.

20 In order to automatize the function of this machine, it is necessary to be able to feed the wire-sections into the feed tube, either singly or severally at one and the same time, if so desired in a reliable manner and in time with the working rate of a machine cycle. This thus requires the provision of an arrangement which will release the desired number of wires into the feed tube in an efficient and reliable manner during each working cycle and at the correct moment in time. Since

the wires must be straight at the time of being fed to the feed tube, in order for the machine to operate efficiently, it is necessary to protect the wires against damage prior to their introduction into the feed tube. The feed arrangement must also be capable of working relatively fast.

The present invention is based on the realization that the aforesaid object can be achieved by keeping the wires protected in channels in a carrier strip during their movement towards the feed tube and by allowing the wires to slide from the carrier strip at a desired given position.

Accordingly, a method of the kind defined in the introduction is characterized mainly in that the wires are disposed loosely in separate channels in a carrier strip which is preferably bendable along lines which extend parallel with said channels; in that the carrier strip is advanced beyond said given position with the channels located generally in a vertical plane; and in that the bottom orifices or openings of respective channels are exposed upon passing said position such as to permit the wire-sections present in respective channels to slide axially therefrom gravitationally, possibly assisted by other forces.

Thus, when practicing the inventive method, the wires are held protected in channels until they reach the desired position, at which only the wire or wires disposed in a particular channel are permitted to slide therefrom during each working cycle of the arrangement, which is thus controlled by the forward feed of the carrier strip.

It is preferred to use a strip which has downwardly

open channels and to draw the strip forwards over a bottom surface which either terminates at said given position or is provided with an opening at said position. The wire or wires will therewith slide automatically down into, e.g., a feed tube when a particular channel is located correctly in a given position.

The strip is preferably taken from a reel or spool mounted in a cassette which is provided with a bottom, and is passed transversely relative to a feed tube in a machine to which said wire-sections shall be delivered. In this respect, the wire-carrying strip is advanced with one pitch spacing between the channels for each working cycle of the machine.

The main characteristic features of an arrangement for use when practicing the method and of a carrier strip used therewith are set forth in the characterizing clauses of respective Claims.

The invention will now be described in more detail with reference to exemplifying embodiments thereof and also with reference to the accompanying drawings.

Figure 1 is a perspective view of a tying or lashing machine according to the aforesaid PCT-application provided with a feed arrangement according to the present invention.

Figure 2 is an exploded view of part of the feed arrangement shown in Figure 1.

Figure 3 illustrates the feed arrangement mounted on the machine of Figure 1 during a working operation.

Figure 4 is a cross-sectional view of the arrangement

shown in Figure 3.

Figures 5 and 6 are longitudinal sectional views through the machine shown in Figure 3, said views being
5 taken perpendicularly to one another.

Figure 7 illustrates a tying or lashing machine according to Figure 1 which is provided with another embodiment of the feed arrangement.
10

Figure 8 illustrates a cassette having a wire-section carrier used with the machine illustrated in Figure 7.

Figure 9 illustrates the cassette of Figure 8 with the carrier slightly extended.
15

Figure 10 is a cross-sectional view of the machine shown in Figure 7, loaded with a cassette according to Figure 8.
20

Figures 11, 12A and 12B are detailed views of a feed mechanism for the wire-section carrier.

Figure 13 is a detailed view of the upper part of the machine illustrated in Figure 7.
25

Figures 14, 15A and 15B show details of the machine illustrated in Figure 13.

Figure 1 illustrates an elongated casing 1 which has a handle 2 provided at the top thereof. Mounted on the lower end of the casing is an electric motor 3 which drives a gearbox 4. The motor is driven by a battery 5
30 mounted on the casing 1. The reference numerals 6 and 7 identify two mutually intersecting reinforcing rods,
35

shown in chain lines, which during a rod-tying operation are embraced on three sides thereof by two lower, pivotal jaws 8 and 9 which function to guide and bend a wire tie into a stirrup shape. The construction of this machine and the manner in which it operates are described in detail in the aforesaid PCT-application, to which the reader is referred.

The machine is provided with a slot 10 through which straight wire-sections shall be introduced into a feed tube mounted in the machine interior. The wires shall normally be dropped down into the feed tube, either singly or two at a time, each time the jaws 8 and 9 are closed around a point of intersection of the rods 6 and 7 respectively. This is achieved in accordance with the present invention with the aid of a cassette magazine 11 which is secured to the machine casing 1 with the aid of appropriate fastener devices 16, such that an outlet part 12 of the cassette will project into the slot 10; see Figure 4.

As illustrated clearly in Figure 2, the outlet part 12 of the cassette 11 has a slot-shaped outlet opening through which a coiled strip of material 13 arranged in the cassette 11 can be withdrawn and caused to pass through a feed tube 14 located in the interior of the machine 1; see Figure 4.

As will best be seen from Figures 2 and 4, the strip 13 has provided therein channels 17 which extend through the strip transversely to its longitudinal axis. In the case of the illustrated embodiment, each channel contains a single wire-section 15. The strip is bendable along lines which extend parallel with the channels and is preferably formed from corrugated fibre-board.

As illustrated in Figures 3 and 4, the carrier strip 13 exits through a slot provided on the other side of the machine, subsequent to having passed through the feed tube 14. The arrangement includes feed devices 18, preferably in the form of toothed wheels which coact with the undulations on the strip 13, such as to move the strip forwards. The toothed wheels, or cogs, can be rotated through one cog or step each time a handgrip 19 is pressed towards the handle 2, said handgrip being connected to the toothed wheels 18 by means of a rod 20. This arrangement ensures that the strip 13 will only be advanced through a distance which corresponds to the pitch spacing of the channels 17 in said strip each time the handgrip 19 is squeezed.

The manner in which the arrangement operates will be evident from Figure 5, which shows that the strip 13, whose channels 17 are downwardly open, is advanced over an outwardly projecting part of the bottom surface 21 of the cassette 11, said bottom surface preventing the wire-sections 15 from sliding from the channels. When, however, a channel reaches the upwardly open feed tube 14, as the strip is indexed forwards, the wire-section or wire-sections present in the channel will fall down through the feed tube. Thus, only one channel is emptied of its wire-section content with each forward step.

As illustrated in Figure 6, respective wire-sections 15 are pressed downwardly in the machine by means of a plunger 22 which is connected to a down-pressing handle 23 by means of a flexible rod 24, such as to enable the plunger 22 to be moved down through the feed tube 14, by means of the handle 23 and caused to pass the jaws 8 and 9 embracing the reinforcement rods, as described in more detail in the aforesaid PCT-application.

The aforescribed arrangement operates positively and affords the important advantage of keeping the wire-sections 15 well protected in the cassette 11 up to the time at which the wire-sections are fed into the feed tube. The cassette 11 or its contents can be easily replaced when a rolled carrier strip has been emptied.

Although not shown, a corresponding collecting device can be provided on the opposite side of the machine, such as to collect the strip material that has passed through the machine and emptied of its wire content.

Figures 7-15 illustrate another embodiment of a feed arrangement according to the invention applied with the same type of tying or lashing machine as that described in the aforesaid PCT-application. However, the arrangement may equally as well be applied to a tying or lashing machine of the kind described in my Swedish Patent Application No. 9200064-5. Accordingly, those parts of the present embodiment which have direct correspondence in the aforescribed embodiment have been identified by the same reference signs as those earlier used and will not again be described.

The machine illustrated in Figure 7 has a fixed casing 25 for receiving a cassette 26, see Figures 8 and 9, which contains a reel of said strip 13 having wire-sections 15 loosely disposed in through-passing channels 17.

The cassette 26 is thus inserted into the casing 25 and the carrier strip is then drawn forwards and inserted through a slot 10 which leads to a collection chamber 27. The carrier strip is therewith in engagement with the feed devices 18, in the form of toothed wheels or cogs, as in the case of the earlier described embodi-

ment. The slot 10 and that part in which the slot is provided may be omitted and the carrier strip instead be pressed against the feed devices 18, which are located adjacent a feed tube 14 in the machine, with the aid of a flap 28 which may include a spring-biased abutment element, in a manner similar to a camera shutter. The flap 28 is provided with a hinge 36 on one side thereof and with a conventional locking device 37 on the other side thereof.

The bottom of the cassette 26 is conveniently covered by means of a thin plate or disk 29 which may be made of metal or a hard plastic material and which is also provided with a short tongue which extends out through the outlet slot of the cassette. This plate, or disc, prevents the bottom ends of the wires 15 from cutting into the bottom of the cassette or from fastening in the outlet slot. The disc thus forms a flat, continuous and very hard contact surface for the ends of said wires.

It will be seen from the sectional view shown in Figure 10 that subsequent to passing the feed tube 14 of the machine, the carrier strip 13 is collected in the chamber 27. In order to enable a tightly rolled carrier strip to be readily obtained, a spring-loaded arm 39 is mounted in the chamber 27. Movement of the arm 39 is stopped by means of a stop pin 40.

It is extremely important that the carrier strip is advanced precisely through a single pitch distance, i.e. the spacing distance between respective channels, on each occasion. A holder 38 for holding a ball 31 loaded by a spring 30 is disposed adjacent the upper toothed wheel 18, as shown in Figure 11, so as to stop advancement of the carrier strip with the strip cor-

rectly positioned, such that one channel 17 will be positioned exactly in line with the feed tube in said machine. The ball 31 therewith locks the toothed wheel precisely in a predetermined position. However, the
5 ball 31 may be pressed into the holder 38 upon rotation of the toothed wheel 18, via the shaft 20, against the action of the spring 30, and then pressed up for coaction with the next tooth gap and therewith again stop the toothed wheel 18 in the next correct wire delivery
10 position.

In order to simplify advancement of the carrier strip and to avoid the requirement of additional manipulations in this regard, the handle 23 is provided at its
15 inner end with an arrangement which moves in the casing 1 and which is provided with an inclined camming surface 32, see Figures 13-15. This inclined camming surface coacts with a finger 33 at the end of the return movement of the handle 23, said finger being
20 connected to the shaft 20 via a bearing 34. The bearing 34 is of the kind which can rotate freely in relation to the shaft 20 in one direction, but when rotated in the other, or opposite direction, causes the shaft
25 20 to accompany its rotary movement.

The finger 33 is biased to the position shown in Figure 15A by means of a spring 35. When the camming surface 32 coacts with the finger 33 as the handle 23 moves upwards, the finger 33 rotates the bearing 34, and
30 therewith the shaft 20, in a clockwise direction to the position shown in Figure 15B. This rotation of the shaft 20 results in feeding movement of the toothed wheels 18 through a distance which corresponds exactly to the pitch distance between the channels 17 in the carrier strip 13. When the handle 23 is again pressed
35 down, prior to a tying or lashing operation, the finger

33 will return to the position shown in Figure 15A, without corresponding movement of the bearing 34 being transmitted to the shaft 20.

- 5 The advantage afforded by this construction is that, prior to each working cycle (tying operation), the carrier strip 13 is advanced automatically through a predetermined distance which corresponds exactly to the pitch distance of the channels 17, and temporarily
10 locks the strip in a correct position with the aid of the ball 31.

As will be understood, the wire-section-carrying strip may comprise material which already contains suitable
15 channels or the like other than corrugated cardboard. Thus, the channels need not have fully closed walls, provided that they enable the wire-sections to be guided in the manner desired.

- 20 The bottom part of the wires may, for instance, be exposed on one side also when using corrugated board material, so as to enable respective wires in respective channels to be inspected. Optionally, one or more feed wheels coacting with the exposed wire ends may be
25 provided for withdrawing the wires from respective channels and feeding said wires to the jaws. This wire withdrawing and wire feeding arrangement will facilitate the feeding of crooked wires and the machine may also be used in a horizontal or upwardly inclined
30 position. The machine may also be used, for instance, by electricians to tie or lash electric cables to cable stages, for instance.

It will also be understood that the aforescribed
35 exemplifying embodiments can be modified within the scope of the following Claims with regard to various

constructional details of the arrangement. For example, instead of using downwardly open channels, there can be used a strip material in which the bottom ends of the channels are closed-off, for instance, with the aid of a tape which is removed as the strip is advanced beyond the position in which the wire-sections shall be delivered. Forward movement of the strip may, of course, also be motorized or controlled by movement of some other part in the machine in which a strip advancing arrangement according to the invention is used. Thus, the inventive arrangement can also be used in machines different to the machines described in the aforesaid patent applications. The essential feature of the invention is that one or more wire-sections are delivered on respective separate occasions in a fully controlled fashion from a large quantity of wire-sections disposed and protected in a cassette.

CLAIMS

1. A method of feeding straight wire-sections to a given position and of delivering said wire-sections at said given position, for example in a feed tube arranged in a machine which is intended to bend the wire-sections into a stirrup shape when joining together rods or the like, *characterized* in that the wires are disposed loosely in separate channels in a strip-like carrier which is appropriately bendable along lines extending parallel with said channels; in that the strip-like carrier is advanced beyond said given position with the channels extending generally in a vertical plane; and in that the bottom openings of the channels are exposed upon passing said given position such as to enable the wire-sections present in respective channels to slide axially from said channels under the influence of gravity, possibly assisted by other forces.
2. A method according to Claim 1, *characterized* by using a carrier strip which has downwardly open channels; and by drawing the carrier strip forwards over a bottom surface which terminates at or has an opening in said given position.
3. A method according to Claim 2, *characterized* by drawing the carrier strip from a roll placed in a cassette which is provided with a bottom; and by passing the carrier strip transversely in relation to a feed tube in a machine to which said wire-sections shall be supplied.
4. A method according to Claim 3, *characterized* by advancing the carrier strip through a distance equal to the pitch spacing of the channels

with each working cycle of the machine.

5. An arrangement for feeding straight wire-sections (15) to and delivering said wire-sections at a given position, e.g. in a feed tube (14) provided in a machine (1) which is intended to bend the wire-sections into a stirrup shape in conjunction with joining together rods (6, 7) or the like, **c h a r a c t e r i z e d** in that the arrangement includes means (12, 18) for feeding a carrier strip (13) beyond said position, said carrier strip comprising mutually separate channels (17) in which wire-sections (15) are loosely disposed and said strip (13) being appropriately bendable along lines which extend parallel to said channels (17); in that the strip is advanced with the channels being located generally in a vertical plane; and in that the arrangement further includes means (21) for exposing the bottom openings of the channels (17) upon passage of said given position (14), such as to enable the wire-sections (15) in respective channels (17) to slide axially from said channels under the influence of gravity, possibly assisted by other forces.

6. An arrangement according to Claim 5 intended for use with a carrier strip (13) having downwardly open channels (17), **c h a r a c t e r i z e d** in that the arrangement includes a bottom surface (21) which prevents the wire-sections (15) from sliding from the channels (17); and in that said bottom surface (21) terminates at said given position (14) or has an opening located in said given position.

7. An arrangement according to Claim 6, **c h a r a c t e r i z e d** in that the arrangement further includes a cassette (11, 26) having a bottom surface which supports a coiled carrier strip (13) containing

5 wire-sections (15); means (18) for drawing the carrier strip from the cassette such that said strip will pass transversely in relation to a feed tube (14) in a machine (1) to which said wire-sections (15) shall be supplied.

10 8. An arrangement according to Claim 7, **c h a r - a c t e r i z e d** by means (18-20; 32-34) for advancing the carrier strip (13) through a distance which corresponds to the pitch spacing between the channels (17) with each working cycle of the machine (1).

15 9. An arrangement according to Claim 8, **c h a r - a c t e r i z e d** in that the carrier strip (13) comprises a strip of corrugated fibreboard; and in that said strip advancing means (18) is intended to engage the undulations of said corrugated strip.

20 10. Strip material suited for use when practicing the method according to Claim 1, **c h a r a c t e r i z e d** in that the strip consists of corrugated fibre-board (13) and in that the channels (17) of said corrugated cardboard contain a desired number of straight wire-sections (15), which are disposed loosely in
25 respective channels.

Fig. 1

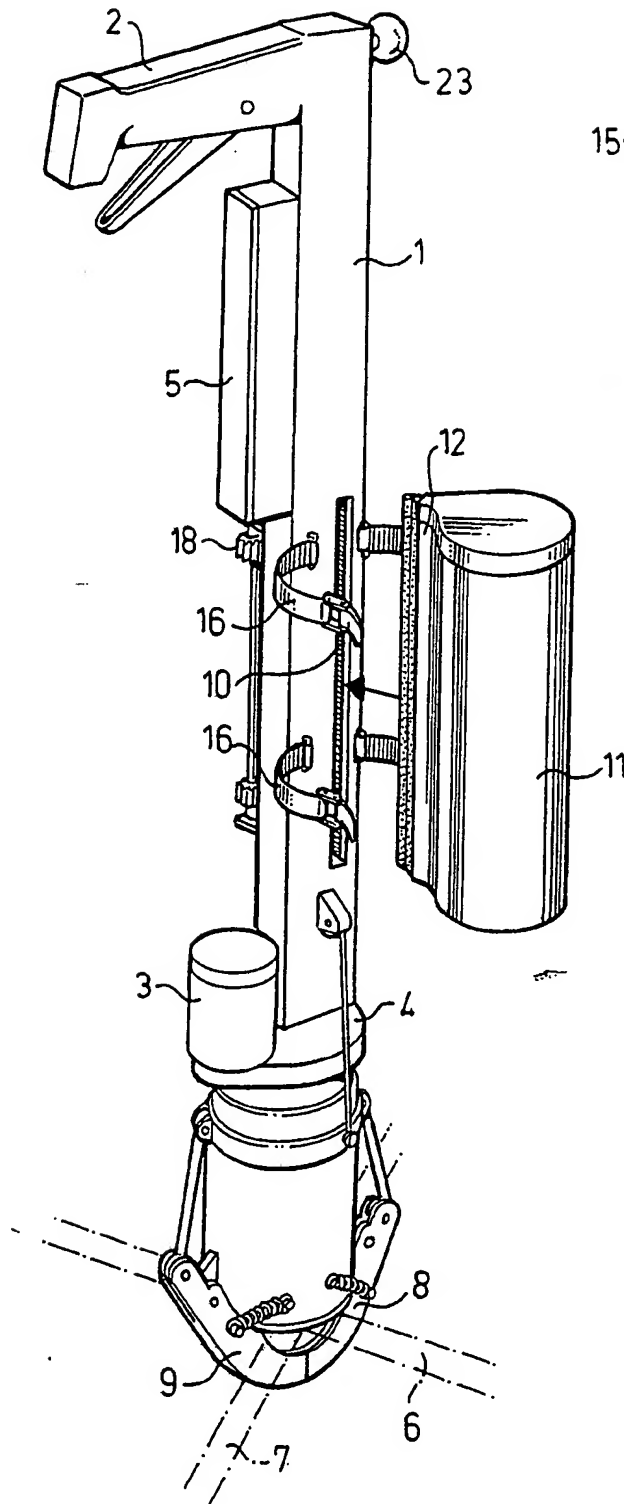


Fig. 2

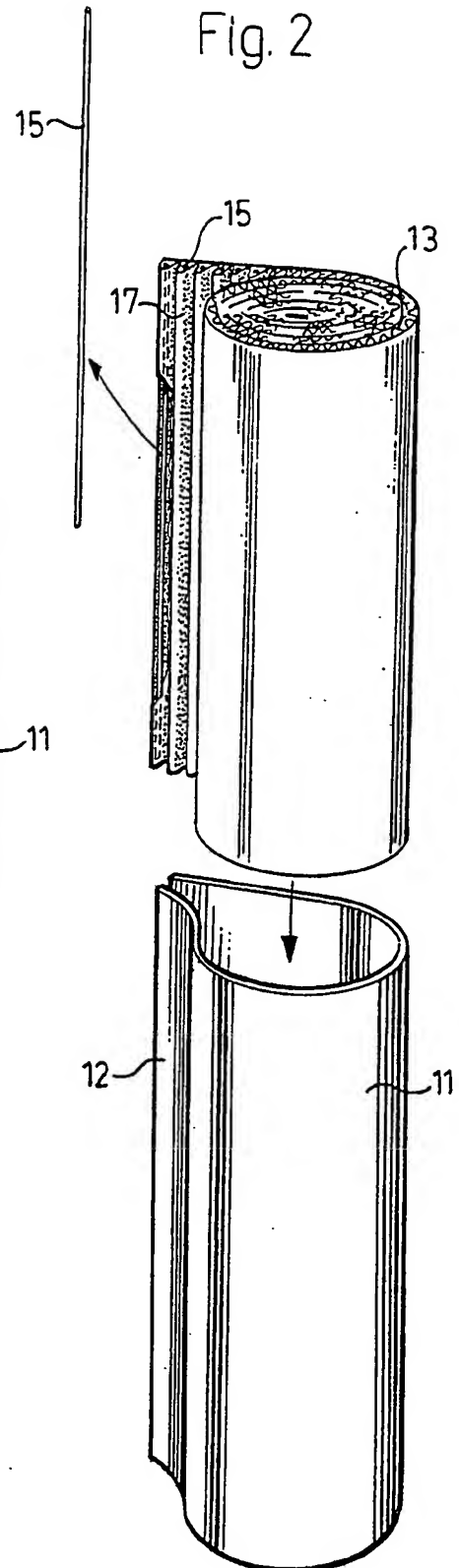


Fig. 4

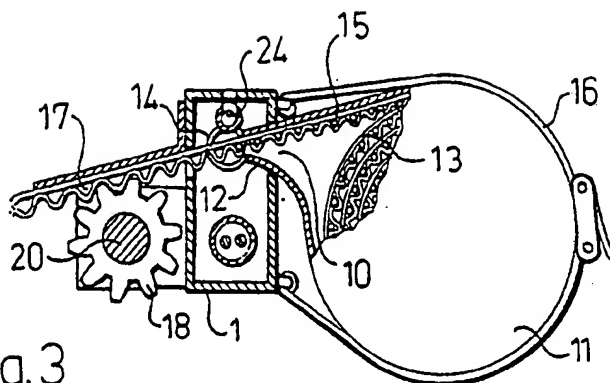


Fig. 3

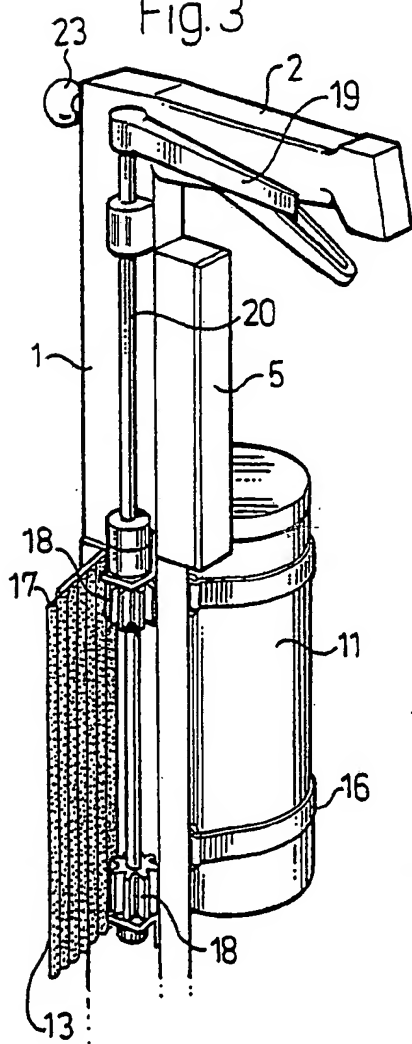


Fig. 6

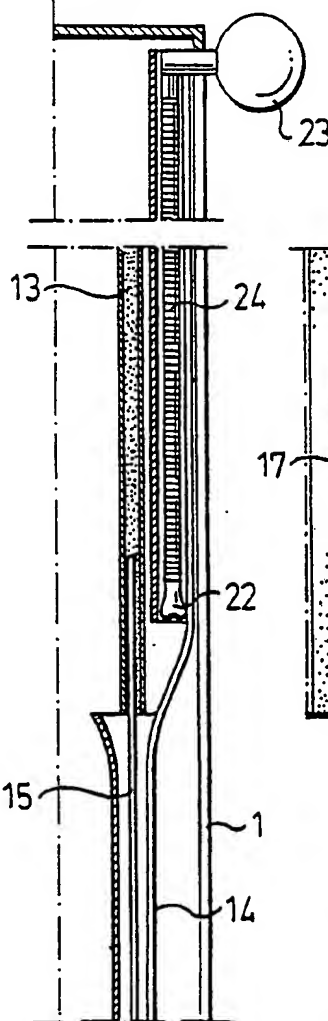
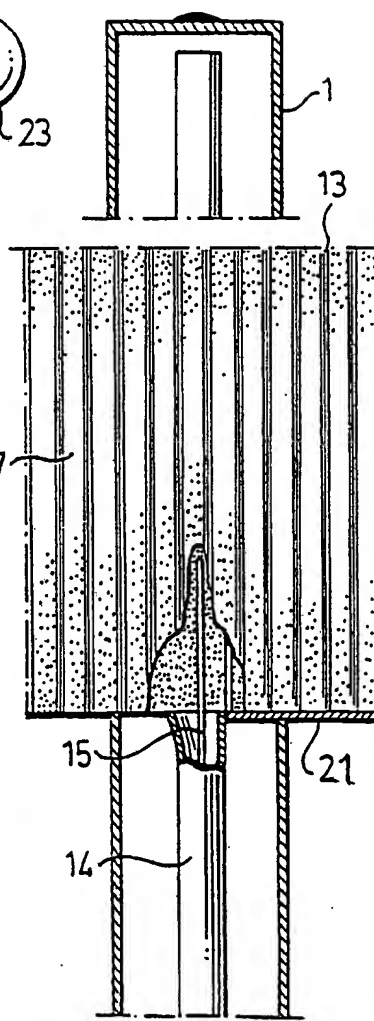
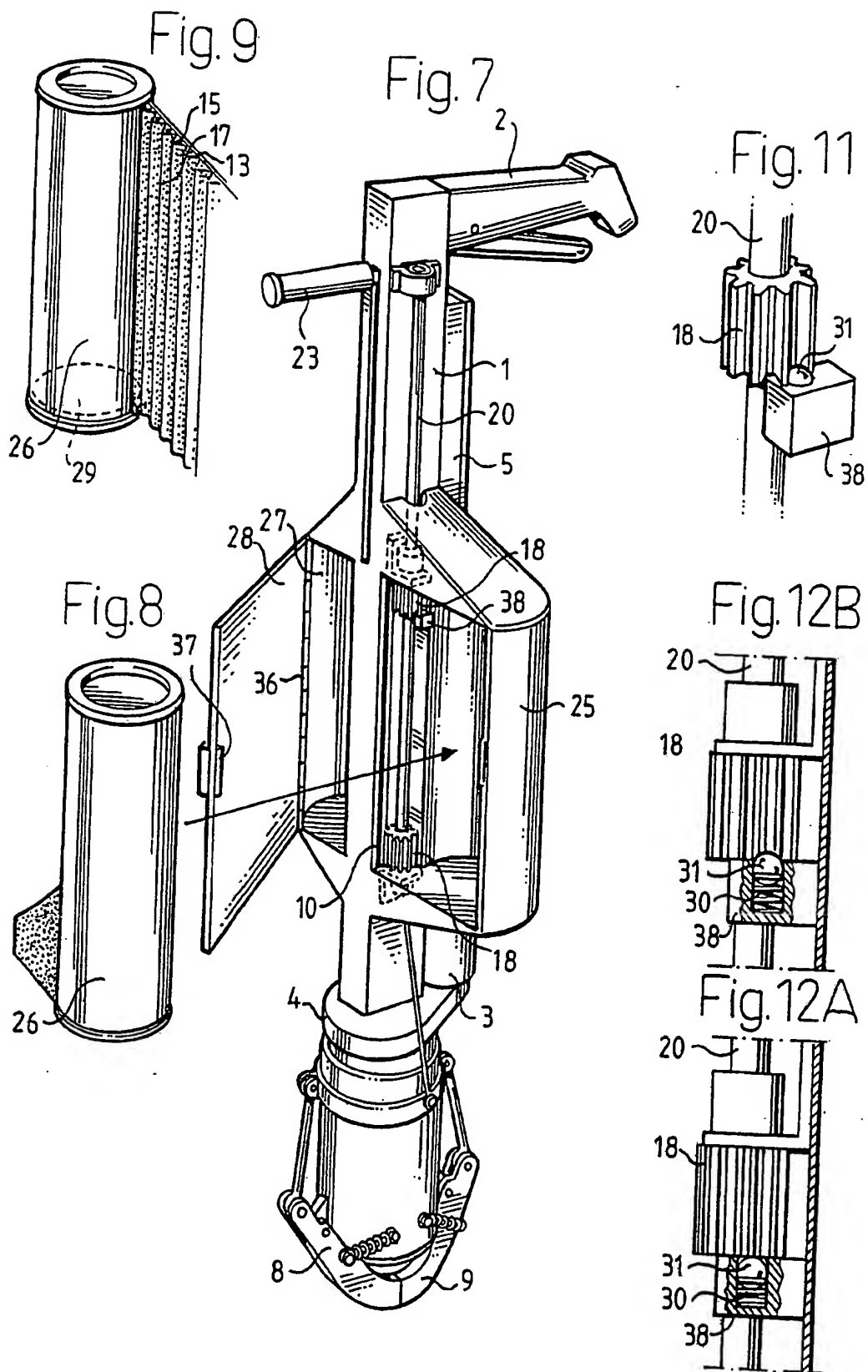
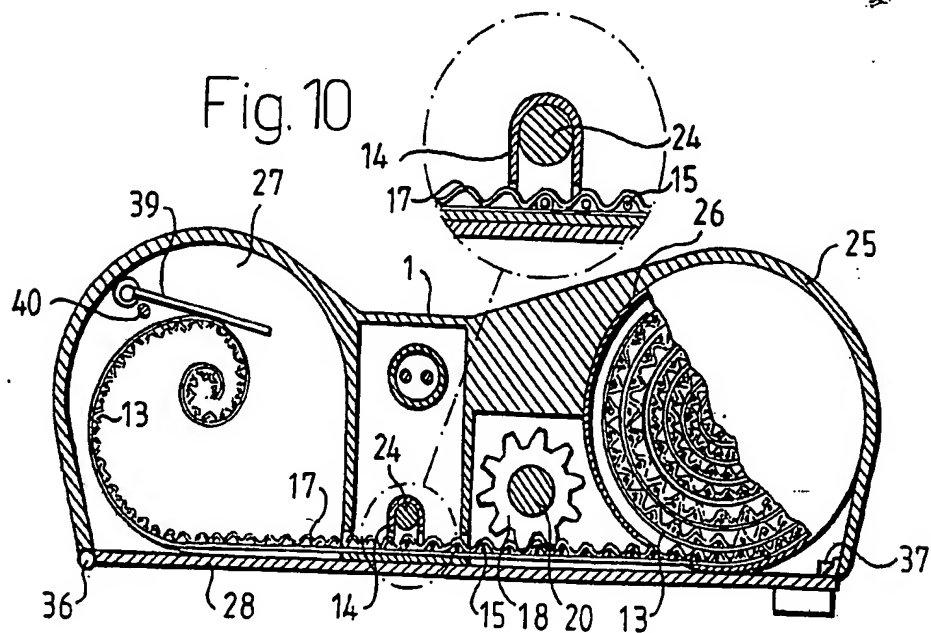
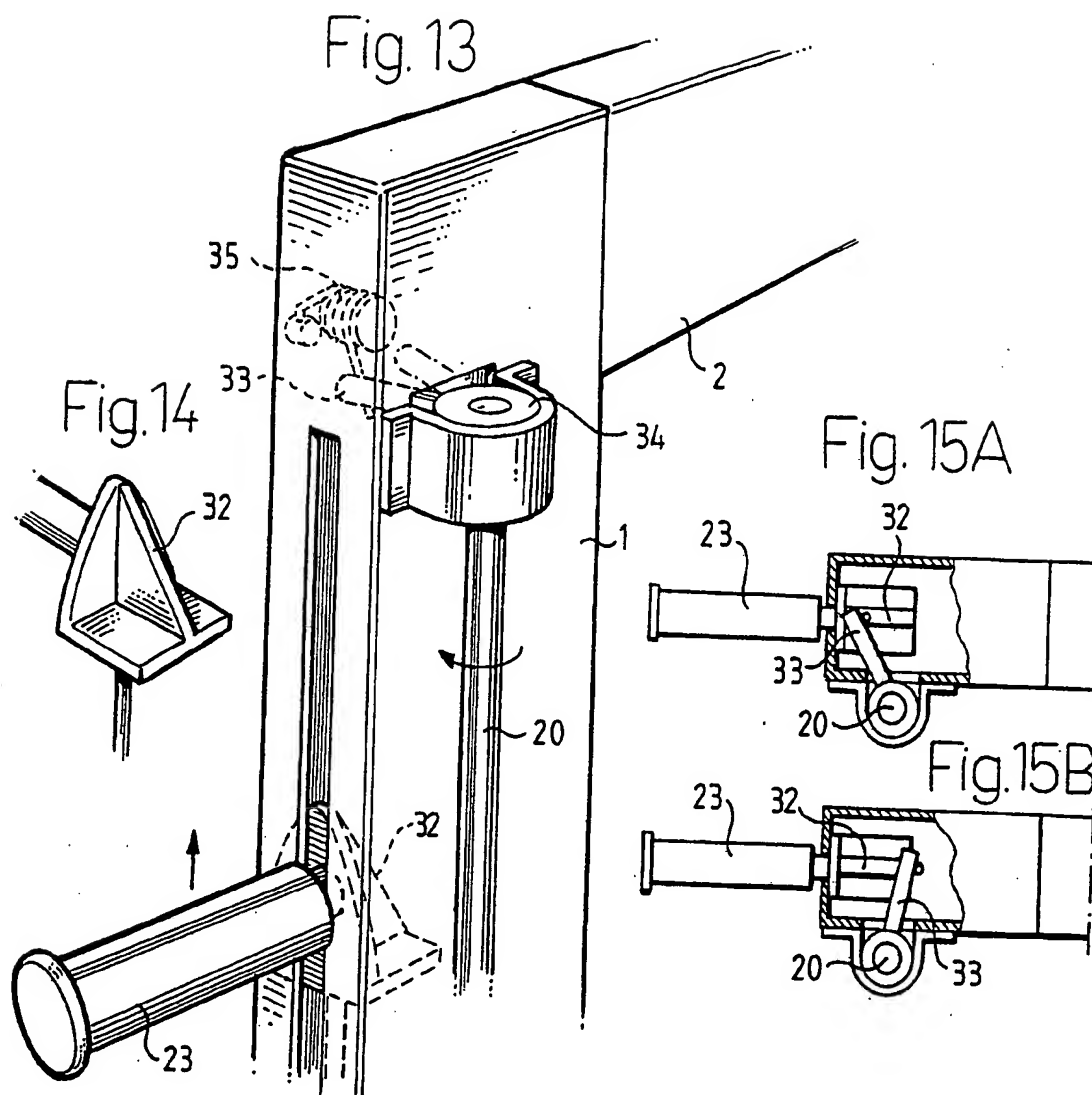


Fig. 5







INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 92/00653

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: E04G 21/12, B21F 15/04, B25B 25/00, B65D 73/02		
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III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	WO, A1, 9013493 (MICKOS, K.) 15 November 1990, see page 3, line 30 - page 4, line 24; figures 1-3 --	1,5, 10
A	US, A, 2881911 (D.F. KRILL) 14 April 1959, see column 1, line 41 - line 68; figures 2,3 --	1,5, 10
A	US, A, 3067424 (H.T. DECOT ET AL) 11 December 1962, see column 2, line 27 - column 3, line 14; figures 1-5 -- -----	1,5, 10
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Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
20th November 1992		25 - 11 - 1992
International Searching Authority		Signature of Authorized Officer
SWEDISH PATENT OFFICE		Ingemar Hedlund

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.PCT/SE 92/00653**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 9013493	90-11-15	CA-A- 2051382 EP-A- 0471776	90-11-12 92-02-26
US-A- 2881911	59-04-14	NONE	
US-A- 3067424	62-12-11	NONE	

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